Docket No. 1460.1014



**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**
**BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES**

In re the Application of:

Yutaka KAI et al.

Serial No. 09/739,218 Group Art Unit: 2828

Confirmation No. 3091

Filed: December 19, 2000 Examiner: Tuan M. Nguyen

For: WAVELENGTH-TUNABLE STABILIZED LASER

## BRIEF OF APPELLANTS

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

**ATTENTION: MAIL STOP APPEAL BRIEF-PATENTS**

In a Notice of Appeal filed December 10, 2003, the Applicant appealed the Examiner's September 10, 2003 Office Action finally rejecting claims 1-18. A fee of $330.00 is being submitted herewith along with a Petition for a One Month Extension of Time and the fee for same. Therefore, Appellant's brief is due March 10, 2004. Appellant's brief together with the requisite fee set forth in 37 CFR § 1.17(f) is submitted herewith.

## I. REAL PARTY IN INTEREST (37 CFR §1.192(c)(1))

The real party in interest is FUJITSU LIMITED, the assignee of the subject application

## II. RELATED APPEALS AND INTERFERENCES (37 CFR § 1.192(c)(2))

Appellant, Appellants' legal representatives, and assignee are not aware of any other appeals or interferences which directly affect or be directly affected by, or having a bearing, on the Board's decision in the pending appeal.

## III. STATUS OF CLAIMS (37 CFR §1.192(c)(3))

Appealed claims 1-18 have been rejected.

## IV. STATUS OF AMENDMENTS (37 CFR §1.192(c)(4))

No amendments were filed subsequent to the Final Office Action mailed September 10, 2003.

## V. SUMMARY OF INVENTION (37 CFR §1.192(c)(5))

Referring to FIGS. 1 through 22, the features of the present invention as set forth in the claims 1-18 are summarized below. Moreover, the present invention relates to a wavelength-tunable stabilized laser which can vary the wavelength of emitted laser light and which, in particular, can almost lock the wavelength the emitted laser light at a desired wavelength.

As shown in FIG. 1, for example, a wavelength-tunable stabilized laser includes a light source 11, a periodic filter 12, a light detecting part 13, and a controlling part 14.

The light source 11 is provided with a plurality of lasers each capable of oscillating at a plurality of wavelengths. Laser light output from the light source 11 is input to the periodic filter 12 having a periodic transmittance–wavelength characteristic. Laser light output from the periodic filter 12 is input to the light detecting part 13, which detects the light intensity of the received laser light and converts it into an electrical signal corresponding to the light intensity. The light detecting part 13 supplies the electrical signal to the controlling part 14. The controlling part 14 generates oscillation of one of the lasers of the light source 11 at a desired wavelength. The controlling part 14 controls the oscillation wavelength of an oscillating laser so that the output value of the light detecting part 13 becomes equal to a target value

corresponding to a desired wavelength among a plurality of target values that are set for the respective wavelengths.

In the above-configured wavelength-tunable stabilized laser, a plurality of target values are set in advance for the respective wavelengths at which oscillation is possible. The controlling part 14 controls an oscillating laser of the light source 11 so that the output value of the light detecting part 13 becomes equal to a target value corresponding to the oscillation wavelength. Since as described above the target values are set for the respective wavelengths and the lasers are controlled so as to attain the target values, it is possible to compensate for the temperature dependence in the transmittance-wavelength characteristic of the periodic filter 12. Accordingly, the wavelength-tunable stabilized laser can emit desired laser light that is stabilized in wavelength irrespective of a temperature variation and a wavelength change.

## VI. ISSUES (37 CFR §1.192(c)(6))

An issue is whether claims 1-18 patentably distinguish over US Patent 6,349,103 to Chung et al.

A key subissue is whether the Chung patent discloses a controlling means for generating oscillation of any one of said plurality of lasers at a desired wavelength, and for controlling an oscillation wavelength of the laser so that an output value of said light detecting means becomes equal to a target value corresponding to said desired wavelength among a plurality of target values respectively set for each of said plurality of wavelengths.

## VII. GROUPING OF CLAIMS (37 CFR §1.192(c)(7))

<u>Group I</u>: Claims 1-5, 8-10, 12-15, 17 and 18 stand or fall together.

<u>Group II</u>: Claims 6 and 7 stand or fall together.

<u>Group III</u>: Claims 11 and 16 stand or fall together.

## VIII. ARGUMENT (37 CFR § 1.192(c)(8))

In the Final Office Action, the Examiner rejected claims 1-18 under 35 U.S.C. § 102(a) as being unpatentable over Chung et al.

**Group I: Claims 1-5, 8-10, 12-15, 17 and 18**

The present invention as recited in claim 1, for example, relates to a device comprising a controlling means for generating oscillation of any one of said plurality of lasers at a desired wavelength, and for controlling an oscillation wavelength of the laser so that an output value of said light detecting means becomes equal to a target value corresponding to said desired wavelength among a plurality of target values respectively set for each of said plurality of wavelengths. Thus, in the present invention, a tunable LD array can output wavelengths of a plurality of channels, by integrating a plurality of LD elements and by changing the temperature. Accordingly, the present invention can solve the problems concerning combining tunable LD array elements which change temperatures, and a Fabry-Pérot etalon filter which is reasonably priced and is temperature-dependent.

Chung teaches multiplexing each of a plurality of DFB lasers 10 individually with a multiplexer 20, as shown in Fig. 2, and modulating the multiplexed DFB lasers each at different values from 5 to 8 kHz, respectively, by adding a small sinusoidal current to the injection current (driving current) (col. 6, lines 10- 19). After each of the lasers is modulated at different values, the DFB lasers are cut out at desired wavelengths by the etalon filter 50, each of what is cut out is then received by the PD 60, and each of what is received by the PD 60 is individually input to the phase-sensitive detector 70. The phase-sensitive detector 70 utilizes a first derivative signal as shown by the dotted lines in Fig. 3 of Chung. Because of this, the oscillating frequency of the DFB lasers must be controlled by the phase-sensitive detector 70, with the proportional amplifier 80 and the integrator 90. (Note that the term "Photo-Sensitive Detector" in Fig. 2 should be "Phase-Sensitive Detector". This is clear from the fact that the specification of Chung uses the term "Phase-Sensitive Detector", and from the characteristics shown in Fig. 3 (col. 5, lines 1- 9)).

In contrast to the teachings of Chung, the present invention does not individually modulate each of the driving currents of the lasers because in tunable lasers, which integrate a plurality of LDs, there is always oscillated only one LD. More specifically, the present invention can arbitrarily control the laser diode (LD) wavelengths on the sloped part of the etalon filter, since wavelengths are controlled so that optical signal power after transmitting through the etalon filter and the optical power not transmitting through the etalon filter are each individually received by the photodiode (PD), and the ratio of the two optical signals are at a constant value

(see Figs. 2, 9, 15 of the Applicant's specification). Thus, the present invention does not lock the wavelength to the point where the change is 0 by using a first derivative signal like Chung.

Further, Chung appears to only lock wavelengths to the peak of the transmission characteristics of the etalon filter. This is due to the fact that Chung performs control with the use of the phase-sensitive detector 70, the proportional amplifier 80, and the integrator 90, all of which are not used in the present invention. Since the peak of transmission characteristics of the etalon filter equals the locking point of the optical signal wavelengths, Chung applies a method of making fine adjustments on peaks of the transmission characteristics of etalon filters, as shown in Fig. 7 of Chung.

However, in the present invention, the locking points of wavelengths are adjustable since locking is done on the slopes of the transmission characteristics of the etalon filter. This is done by storing in the memory (shown in Figs. 2, 9, and 15 of the Applicant's specification) what value the ratio of the power of the optical signal after having transmitted through the etalon filter to the power of the optical signal not having transmitted through the etalon filter, should be controlled to be. For example, in Fig. 12, if ch. 0, 1535.82nm is to be oscillated, the value is controlled so to be (optical signal power transmitted through etalon filter)/(optical signal power not transmitted through etalon filter) = 0.4 after the LD201-1 is driven and the temperature is controlled to 16°C. In this case, the value of 0.4 is stored in the memory, and the temperature of the LD is adjusted so that the quotient of the two PDs = 0.4. This value, which decides where the locking points are to be, is stored in each of the channels 0- 32 in the memory.

Accordingly, in the present invention, it is possible to freely change the locking positions of the wavelengths back and forth. This is made possible by changing the value obtained from calculating the two PD values, which decides where the locking point of the wavelengths should be. Chung does not perform this type of control, and this type of control is unable to be realized in light of the configuration (see Fig. 2) of Chung.

Thus, the present invention and Chung differ in the numbers of circuits controlling temperatures, that each the present invention and Chung et al. needs in configuring the inventions. For example, Chung must have the same number of circuits that control temperature as the number of DFB-LDs, since Chung includes a plurality of normal DFB-LDs and oscillates them individually. On the other hand, the present invention controls the

temperatures of all of the LD array elements with a single control circuit, making the configuration of the present invention completely different from that of Chung.

In light of the above, Chung does not disclose the features of the present invention. Therefore, it is respectfully submitted that Chung does not disclose the features recited in claims 1-5, 8-10, 12-15, 17 and 18 of the present invention.

**Group II: Claims 6 and 7**

Claims 6 and 7 patentably distinguish over the cited prior art for the same reasons given in Group I above, and for additional reasons described below.

For example, the optical amplifying means as recited in claim 6 of the present invention is an optical amplifier, and the amplifying means in Chung is an electric amplifier. In the Office Action mailed September 10, 2003, the Examiner indicated that the amplifying means (80) in claim 6 of the present invention, is taught by Chung. However, it is respectfully submitted that optical amplifiers and electric amplifiers are not the same.

**Group III: Claims 11 and 16**

Claims 11 and 16 patentably distinguish over the cited prior art for the same reasons given in Group I above, and for additional reasons described below.

More specifically, Chung does not disclose a plurality of etalon filters as recited in claims 11 and 16. Thus, it is respectfully submitted that Chung does not disclose the features recited in claims 11 and 16 of the present invention.

## IX. CONCLUSION (37 CFR § 1.192(c)(9))

In summary, it is submitted that claims 1-18 patentably distinguish over the prior art. Reversal of the Examiner's rejection is respectfully requested.

* * *

The Commissioner is authorized to charge any Appeal Brief Fee or Petition for Extension of Time fee for underpayment or credit any overpayment to Deposit Account No. 19-3935.

Respectfully submitted,
STAAS & HALSEY

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## X. APPENDIX (37 CFR § 1.192(c)(10))

1. (previously presented) A device comprising:

a light source having a plurality of lasers to oscillate at a plurality of wavelengths;

an etalon filter having a periodic transmittance-wavelength characteristic for receiving laser light output from said light source;

light detecting means for receiving laser light output from said etalon filter and detecting light intensity of the received laser light; and

controlling means for generating oscillation of any one of said plurality of lasers at a desired wavelength, and for controlling an oscillation wavelength of the laser so that an output value of said light detecting means becomes equal to a target value corresponding to said desired wavelength among a plurality of target values respectively set for each of said plurality of wavelengths.

2. (previously presented) A device according to claim 1, wherein, laser light output from said light source has nearly constant wavelength spacing,

a length of a period of said etalon filter is substantially equal to a length of said wavelength spacing, and

each of said plurality of target values is set at a value between two adjacent extremums of said transmittance-wavelength characteristic.

3. (original) A device according to claim 2, wherein a target value corresponding to a center wavelength of said plurality of wavelengths is set at a value at approximately the center of two adjacent extremums of said transmittance-wavelength characteristic.

4. (original) A device according to claim 2, wherein said controlling means controls said oscillation wavelength after generating oscillation of said one laser at a wavelength which is in a range including a wavelength approximately at the center of two adjacent extremums of said transmittance-wavelength characteristic, the range included in ranges between said desired wavelength and a wavelength closest to said desired wavelength and having an extremum of said transmittance-wavelength characteristic.

5. (original) A device according to claim 2, wherein said controlling means controls said oscillation wavelength after generating oscillation of said one laser at a wavelength which is closest to said desired wavelength and is approximately at the center of two adjacent extremums of said transmittance-wavelength characteristic.

6. (previously presented) A device according to claim 2, further comprising:
optical amplifying means for amplifying laser light to be output to an exterior.

7. (original) A device according to claim 6, wherein said optical amplifying means is used in a saturation range.

8. (previously presented) A device according to claim 2, wherein said plurality of lasers are semiconductor lasers, and
said controlling means controls said oscillation wavelength by controlling device temperature of said one laser.

9. (previously presented) A device according to claim 2, wherein said plurality of lasers are semiconductor lasers, and
said controlling means controls said oscillation wavelength by controlling driving current of said one laser.

10. (previously presented) A device according to claim 2, wherein said plurality of lasers are semiconductor lasers, and
said controlling means controls device temperature of said one laser when generating oscillation of said one laser and controls driving current of said one laser when controlling said oscillation wavelength.

11. (previously presented) A device according to claim 1, further comprising:
a plurality of etalon filters whose transmittance-wavelength characteristics are the same in period and temperature dependence; and

a plurality of light detecting means corresponding with the said plurality of etalon filters, respectively, to receive laser light output from the filters.

12. (previously presented) A device according to claim 11, wherein laser light output from said light source has nearly constant wavelength spacing,

each of said spacing is divided into a plurality of wavelength ranges, and

each of said wavelength ranges is respectively within ranges between two adjacent extremums of said transmittance-wavelength characteristics of said plurality of filters.

13. (previously presented) A device according to claim 1, wherein said etalon filter has temperature dependence, which is said transmittance-wavelength characteristic, in accordance with temperature dependence of an oscillation wavelength of said plurality of lasers.

14. (previously presented) A device comprising:

a laser to oscillate at a plurality of wavelengths;

an etalon filter for receiving laser light output from said laser, which transmittance-wavelength characteristic is temperature dependence in accordance with temperature dependence of an oscillation wavelength of said laser;

light detecting means for receiving laser light output from said etalon filter and detecting light intensity of the received laser light; and

controlling means for generating oscillation of said laser at one of said plurality of wavelengths, and controlling an oscillation wavelength of laser light output from said laser so that an output value of said light detecting means becomes equal to a target value that is set for each of said plurality of wavelengths.

15. (previously presented) An apparatus, comprising:

a light source having a plurality of lasers to oscillate at a plurality of wavelengths;

an etalon filter having a periodic transmittance-wavelength characteristic to receive laser light output from said light source;

a light detecting unit to receive laser light output from said etalon filter, and to detect light intensity of the received laser light; and

a control unit to generate oscillation of any one of said plurality of lasers at a desired wavelength, and to control the oscillation wavelength of the laser so that an output value of said light detecting unit becomes equal to a target value corresponding to said desired wavelength among a plurality of target values respectively set for each of said plurality of wavelengths.

16. (previously presented) An apparatus, comprising:

a light source having a plurality of lasers to oscillate at a plurality of wavelengths;

etalon filters, each having a periodic transmittance-wavelength characteristic to receive laser light output from said light source;

light detecting units to correspond to said etalon filters, respectively, to receive laser light output from said etalon filters, and to detect light intensity of the received laser light; and

a control unit to generate oscillation of any one of said plurality of lasers at a desired wavelength, and to control the oscillation wavelength of the respective laser of said plurality of lasers so that an output value of the respective light detecting unit becomes equal to a target value corresponding to said desired wavelength among a plurality of target values respectively set for each of said plurality of wavelengths.

17. (previously presented) An apparatus, comprising:

a light source having a plurality of lasers to oscillate at a plurality of wavelengths;

a light detecting unit to receive laser light output from an etalon filter, and to detect light intensity of the received laser light; and

a control unit to generate oscillation of one of said lasers at a desired wavelength, and to control the oscillation wavelength of the laser so that an output value of said light detecting unit becomes equal to a target value corresponding to said desired wavelength.

18. (previously presented) A method comprising:

oscillating a plurality of wavelengths output from a plurality of lasers of a light source;

receiving laser light output from said light source with an etalon filter having a periodic transmittance-wavelength characteristic;

receiving laser light output from said etalon filter and detecting light intensity of the received laser light; and

generating oscillation of one of said plurality of lasers at a desired wavelength, and controlling the oscillation wavelength of the laser so that an output value of said detecting becomes equal to a target value corresponding to said desired wavelength among a plurality of target values respectively set for each of said plurality of wavelengths.